US Army Corps of Engineers®
Engineer Research and Development Center

Multibeam Survey

Description

Multibeam sonars are highly sophisticated instruments used for hydrographic surveys in areas requiring total bottom coverage. The multibeam sonar system has a single transducer, or pair of transducers, that continually transmit numerous sonar beams in a swath or fan-shaped signal pattern. They are ideal systems for mapping large areas rapidly, with essentially 100 percent bottom coverage. Multibeam signal backscatter information can be used to generate sidescan data for imaging bottom features and targets in a wide variety of water depths. The coverage area of these systems is a function of water depth and number and pattern of beams . Most systems provide coverage ranging from two to approximately seven times the water depth. The number of beams also varies with the manufacturer and ranges from 30 to more than 240; however, the outer beams on each side of the swath are subject to more errors and may not be useful. Because of the increased density of soundings with multibeam systems, it is possible, with proper calibration and adjustments, to detect and resolve smaller objects on the bottom relative to single beam systems. Transducer frequencies used by the U.S. Army Corps of Engineers (USACE) range from 200 to 455kHz.

Capabilities

The USACE uses multibeam sonar technology in channel and harbor surveys. Multibeam sonar systems are recommended for construction dredging measurement and payment surveys in these shallow waters, where the accuracy requirements can be the most critical and the need for correct and thorough calibration becomes essential. At present, USACE districts have acquired two different types of multibeam transducers from different manufacturers – Reson, Inc. and Odom Hydrographic Systems, Inc. In addition, the navigation and acquisition software used by most USACE districts is HYPACK and HYSWEEP, produced by Coastal Oceanographics Inc.

Supporting Technology

Surveys performed with multibeam sonar require specialized calibration procedures that are documented in the USACE manual EM 1110-2-1003 (Hydrographic Surveying). In addition, workshops and conferences are conducted at several forums throughout the year for additional training and education on this technology.

Benefits

The benefits to using multibeam sonar in hydrographic surveying include increased bottom coverage, higher resolution of bottom features, improved target identification, more coverage in difficult survey areas (ie, under barges, piers, anchored vessels) and improved change detection of bottom conditions.

Success Stories

Several USACE districts have purchased or contracted services for these systems and can verify their performance advantages over single beam systems. These districts include Galveston, Los Angeles, Wilmington, New York, Buffalo, St. Louis, Jacksonville and New England.

Point of Contact

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